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# CHAPTER FIVE – EVENT OPERATIONS PLANNING AND COORDINATION


**Figure 18**
**Event Planning Team Meeting**

## PURPOSE

This chapter describes event-specific *advance planning activities*, summarizes *feasibility study* analysis steps specific to a planned special event, and highlights *external factors* affecting the scope of event impact on transportation system operations.

## INTRODUCTION

This chapter examines advance planning and stakeholder coordination activities conducted for a specific planned special event. It represents the first of three successive chapters on the event operations planning phase. This chapter will detail an event operations planning framework and schedule. Emphasis is placed on the initial planning activities required to size-up event impacts. This includes conducting a planned special event feasibility study.

A section on advance planning activities describes input data requirements for analyzing the event impact and discusses scenarios linked to particular events that may require

the development of a contingency plan. The section lists transportation system performance objectives, and associated facility-specific measures of effectiveness, that satisfy the customer service requirements of event patrons and other road user classes. It presents an event operations planning schedule and lists various products of the event operations planning phase. The section concludes by examining situations necessitating public involvement, summarizing the feasibility study and traffic management plan review process, and identifying successful institutional arrangements for managing and operating a planned special event.

The event feasibility study section presents travel forecast process strategies and considerations for estimating modal split, event-generated traffic demand, and vehicle occupancy factors. It reviews techniques for identifying a market area and directional distribution of event-generated traffic. The section reviews methodologies for identifying and evaluating the sufficiency of available venue parking supply based on event parking demand and existing conditions. It specifies traffic demand analysis and roadway capacity analysis strategies, including the application of various traffic modeling and capacity analysis tools. To provide a lead-in to the following two chapters on event operations planning, the section describes a toolbox of mitigation strategies for adjusting event trip generation levels as well as increasing transportation system capacity.

This chapter concludes with an examination of external factors that may create considerable impact on transportation system operations if ignored. A feasibility study may not account for issues such as available resources, weather, concurrent road construction activities, and concurrent planned special events. These factors must be accounted for early in the advance planning process and accounted for in traffic management plans prepared for a planned special event.

# ADVANCE PLANNING ACTIVITIES

## Stakeholder Roles and Coordination

The event planning team handles tasks associated with *event-specific operations planning* and *traffic management plan implementation*. Table 65 lists the primary responsibilities of the event planning team under the event operations planning phase. The event planning team consists of a diverse group of stakeholders with either event operations or community interest as their focal point. The success of the multi-disciplinary event planning team rests on achieving strong coordination among participating team stakeholders.

| RESPONSIBILITY |
| --- |
| • Perform feasibility study.<br>• Develop traffic management plan.<br>• Evaluate travel demand management initiatives. |

**Table 65**
**Event Planning Team Responsibilities Under the Event Operations Planning Phase**

An event planning team forms as a result of either: 1) Coordination among a traffic operations agency, law enforcement, and event organizer that represent the core event planning team stakeholders or 2) Creation of a committee on special events within a greater transportation operations management organization, such as a traffic incident management program. The former typically de-

scribes event planning teams formed in response to local planned special events in rural or urban areas. The latter may occur in metropolitan areas where large-scale planned special events happen frequently, thus warranting an *on-call* event planning team.

In establishing an event planning team, the core stakeholders must develop a working trust with each other. This trust results when stakeholders realize that a planned special event necessitates the same relationships cultivated in daily traffic and incident management. A joint operations policy or other memoranda of understanding strengthens the cooperative bond among core stakeholders. These institutional arrangements identify common goals of the partnering agencies.

Prior to initiating the event operations planning process, the core event planning team should adopt a mission, or purpose, and solicit buy-in from public agency stakeholders, the community, and other peripheral stakeholders. In identifying pertinent jurisdictions, the event planning team may consider contacting stakeholders within a certain distance (e.g., five miles) of the event venue. The event planning team can obtain buy-in from community interest stakeholders more easily when a core group of stakeholders already exists, including public agencies. Elected officials and the public can serve as advocates for the event planning team; therefore, participation from these stakeholders should occur early in the event operations planning phase.

*Consensus* among stakeholders drives interagency coordination. Stakeholders must remain focused on the goals and objectives of the event planning team. This includes concentrating on tasks that can be successfully accomplished collectively. Participating stakeholders must recognize that the motivations of individual agencies may differ and that the event planning team does not have authority over individual stakeholders. Yet, the team can foster a cooperative spirit among stakeholders by emphasizing that participants *own* a part of the event planning team's common goals. In turn, team goals and objectives create incentives for individual stakeholders.

Common barriers to event planning team progress include *resource constraints* and *jurisdictional barriers*. Resource constraints surface when stakeholders assign a lower priority to the planned special event. In satisfying individual and team goals, stakeholders may have to make temporary project and program sacrifices, in terms of personnel and equipment reassignment, to provide benefits to the event operations planning effort. Jurisdictional barriers arise when two or more stakeholders are unclear on their duties and responsibilities. Do not allow participating agencies to feel left out. At the time of buy-in, the event planning team must indicate which stakeholders are required on an as-needed basis. The team must have the ability to communicate effectively with stakeholders having a peripheral involvement in the overall planning effort.

A *transportation operations management program committee* on special events features stakeholders that have achieved interagency coordination through past, cooperative travel management efforts. Stakeholder representatives personally know one another, and agencies have knowledge of the resources and capabilities of each committee participant. Stakeholders commonly include traffic operations agencies, law enforcement, transit agencies, event organizers or venue operators, and the media. Committees in metropolitan areas may create task forces for specific planned special event venues or re-

curring large-scale events. The committee or task force generally meets and performs event operations planning tasks on an as-needed basis. The group may also convene regularly (e.g., weekly, monthly, or quarterly) to review strategic planning efforts or future planned special events.

Table 66 lists the various stakeholders comprising an event planning team. The table indicates the typical function of each participating stakeholder in producing the products generated in the event operations planning phase: 1) Feasibility study, 2) Traffic management plan, and 3) Travel demand management. Stakeholders contribute data, communicate needs, and/or furnish resources. Often, certain agencies promote initiatives developed by the event planning team, such as travel demand management strategies.

## Situation Analysis

Feasibility study input data requirements reflect measures of the three core factors that determine the impact of the event: *travel demand*, *road/site capacity*, and *event operation*. Table 67 summarizes various types of input data to consider in a feasibility study. This includes *transportation system infrastructure*, *background traffic*, and *area* data and information. With the assistance of other event planning team stakeholders most data types are accessible.

| STAKEHOLDER | ROLE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | FEASIBILITY STUDY | | | TRAFFIC MANAGEMENT PLAN | | | TRAVEL DEMAND MANAGEMENT | | | |
| | INPUT | DEVELOP | REVIEW | INPUT | DEVELOP | REVIEW | INPUT | DEVELOP | REVIEW | PROMOTE |
| Traffic Operations Agency | • | • | • | | • | • | | • | • | • |
| Law Enforcement | | | | • | • | • | | | | |
| Event Organizer | • | | | • | • | | | • | | • |
| Fire and EMS | | | | • | • | • | | | | |
| Elected Official | | | • | • | | • | | | • | • |
| Transit Agency | • | | | • | • | | | • | | • |
| Public | | | • | • | | • | • | | • | |
| Private Transportation Consultant | | • | | | • | | | • | | |
| Private Traffic Control Vendor | | | | • | | | | | | |
| Media | | | | • | | | | | | • |
| Office on Special Events / Permits | | | • | | | • | | | | |
| Emergency Management Agency | | | | | | • | | | | |
| Regional Coalition | | | • | | | • | | | • | • |

**Table 66**
**Stakeholders Involved in Event Operations Planning**

| FACTOR | INPUT DATA | DESCRIPTION |
|---|---|---|
| Travel Demand | • Event patron traffic | • Daily attendance<br>• Event patron demographics (e.g., advance/season ticket holder place of residence or zip code)<br>• Admission (general/reserved seating and free/cost)<br>• Venue attendance capacity<br>• Acceptable walking times (e.g., to determine available parking areas and percent walking trips) |
| | • Background traffic | • Hourly traffic volumes<br>• Parking occupancy<br>• Vehicle classification |
| | • Venue area | • Employment centers in venue vicinity (e.g., number of jobs)<br>• Hotels in venue vicinity |
| | • Historical data (similar events) | • Attendance (e.g., trip generation rate)<br>• Hourly traffic volumes<br>• Parking demand (e.g., parking demand rate)<br>• Vehicle occupancy<br>• Hourly/sub-hourly event patron arrival and departure distribution<br>• Modal spilt<br>• Patron survey (e.g., demographics and travel) |
| Road/Site Capacity | • Roadway facilities | • Prime corridors serving event patron arrival and departure<br>• Freeways and associated entrance and exit ramps serving the venue<br>• Arterials serving venue and venue access road intersections<br>• Surface streets connecting freeway access points or arterials<br>• Pedestrian (e.g., sidewalks and crossings) and bicycle accommodation<br>• Geometrics and regulations<br>• Traffic control systems and traffic signal programming data<br>• Toll plazas (freeway or bridge/tunnel) in venue vicinity |
| | • Parking availability | • Location and capacity of site access points<br>• Location and capacity of off-street venue parking areas (free and paid)<br>• Location and capacity of permitted on-street parking areas<br>• Location and capacity of overflow parking areas |
| | • Transit availability | • Number and location of transit stations serving venue (e.g., public transportation – bus and rail)<br>• Scope of transit services at identified stations (e.g., schedule and capacity)<br>• Origin and scope of established charter bus service to venue (e.g., scheduled express bus service from park and ride lots)<br>• Base transit spilt (e.g., without incentive or promotion) |
| Event Operation | • Event logistics | • Venue location<br>• Event hours of operation<br>• Site opening and closing times<br>• Participant accommodation (e.g., arrive by bus, stay at hotel near venue, etc.)<br>• Event personnel and volunteer travel demand |
| | • Site | • Required road closures to stage event |
| | • Parking | • Number of parking spaces lost in order to stage event (e.g., parking for event participants, hospitality tents, etc.) |

**Table 67**
**Event Impact Analysis Data Requirements**

Travel demand data shape the event travel forecast and area of impact. Background traffic data define the scope of available roadway and off-site parking capacity for event patron traffic. Information describing the venue area assists in identifying possible event patron trip origins. For example, a venue located in a downtown area may attract a significant number of patrons arriving from work. Events having a regional or greater scope may involve a significant number of patrons staying at area hotels. To increase travel forecast accuracy and meet the goal of *achieving predictability*, practitioners should research appropriate historical data.

The identification and quantification of site and transportation system capacity involves performing a full inventory of the transportation system infrastructure serving the event venue. This includes obtaining data on roadway geometrics and associated regulations (e.g., speed limits and travel restrictions). Freeway components, such as ramp junctions and weaving sections, as well as surface street traffic control devices must be identified and saturation flow rates determined. Transit agencies may assist in determining a base transit split, without service incentives or promotion, for patrons traveling to/from the event.

Event operation affects both travel *demand* and available *capacity*. Certain event logistics, combined with historical data, help determine the profile of event patron arrivals and departures. Practitioners, in tandem with the event organizer, must also identify the scope of road closures and parking area needed just to stage the event. This does not include roadway capacity or parking needed to accommodate event patron traffic.

## Risk Assessment

Based on the type and purpose of a planned special event, there exists potential scenarios where event patron or non-attendee behavior may cause overcrowded conditions in the vicinity of an event venue and/or create unplanned road closures. The event planning team must assess the nature of a proposed event and determine the need to incorporate special contingency plans in response to potentially dangerous situations that will interfere with the planned travel management on the day-of-event. Table 68 lists four notable event-oriented risk scenarios associated with some planned special events.

Certain political or socially controversial planned special events may provoke a demonstration or protest. Those attending

| EVENT-ORIENTED RISK | EXAMPLE SCENARIO |
|---|---|
| Demonstration or protest | • Any event that is political in nature or invokes social concern<br>• Political conventions and parades |
| Ticketless event patrons causing overcrowding | • Sold-out sports championship games<br>• Sold-out concerts involving select performers |
| Fan celebration | • Response to city or school sports team winning a championship |
| Event patron violence | • Motorcycle rally violence between patrons and/or participants |

**Table 68**
**Summary of Event-Oriented Risk Scenarios**

the demonstration represent non-attendees, and the event planning team often has little or no advance information regarding the demonstration's specific location and time of occurrence. The event planning team should obtain access to relevant law enforcement intelligence reports regarding potential demonstrations to develop an effective travel management contingency plan. In the event of the threat of an unplanned road closure, the event planning team should consider developing an alternate route contingency plan detailing the personnel and equipment resources necessary to effect an immediate diversion of traffic. Appendix B contains a contingency diversion routing plan prepared in response to the potential for demonstrations during the 2000 Republican National Convention in Philadelphia, PA.

The occurrence of sports championship games or major concerts at venues having a defined *sell-out* capacity may attract *ticketless* event patrons not accounted for in event travel forecasts and impact mitigation strategies. Events such as the Super Bowl or National Collegiate Athletic Association (NCAA) Final Four cause an increase in area visitors beyond the actual event participants and patrons. Sold-out music festivals may attract persons wanting to tailgate in venue parking areas despite not having a ticket. For instance, event planners originally anticipated 200,000 people to attend a two-day *Grateful Dead* reunion concert at a 35,000 seat amphitheater in rural East Troy, WI, located approximately 30 miles southeast of Milwaukee. The Walworth County Highway Committee initially denied the event organizer a permit to hold the two concerts. After the event organizer unveiled a comprehensive security and traffic management plan that included using advance checkpoints to turn away any vehicle that contained a ticketless occupant, county executives overturned their decision and issued a permit[31]. Appendix B contains a list of restrictions imposed by the event organizer and event planning team to prevent ticketless event patrons from gaining access to the venue parking areas.

Another severe impact risk associated with sports championship games involves fan celebrations that occur when a city sports team wins a championship at home. In this case, the traffic management team charged with managing travel during event egress must also mitigate traffic impacts caused by non-attendees converging on the venue site and unruly fans disrupting traffic and pedestrian flow. For instance, the Detroit Red Wings won the 2002 Stanley Cup in Detroit. Operating from past experience, the Michigan State Police began closing portions of Interstate 75 and the Lodge Freeway (State Route 10) leading to downtown Detroit and the event venue. This contingency plan went into effect at the start of the final period of play with Detroit leading the championship clinching game[32]. Contingency plan details were even posted in advance on Red Wings' fan web sites. Located approximately 16 miles north of the event venue, Royal Oak police and city officials maintained road closure contingency plans to accommodate the thousands of fans that went to the popular clubs and bars to celebrate the home team win[33].

An outbreak of violence among event patrons warrants special security precautions to contain and capture potential suspects. Law enforcement may initiate a road closure as a first response to discourage people from entering and leaving the region where the violence took place. During the 2002 Laughlin, NV River Run motorcycle rally, attended by tens of thousands of motorcycle enthusiasts, a multiple homicide occurred after a clash between rival motorcycle gangs. In an effort to capture the homicide

suspects, Nevada officials closed all highways and arterials serving Laughlin, including Nevada State Route 163 at the Nevada/Arizona border as shown in Figure 19. Trucks traveling U.S. 93, a North Atlantic Free Trade Agreement (NAFTA) designated trucking corridor, traverse State Route 163 because of prohibitions on crossing the Hoover Dam. Law enforcement maintained the road closures for a few hours[34]. A possible traffic management contingency plan prepared in advance of the described security incident would specify a regional alternate route plan coupled with regional traveler information.

**Figure 19**
**Nevada State Route 168 Closure During Motorcycle Rally** ***(Photo courtesy of the Laughlin Free Press)***

## Performance Goals and Objectives

The goals of managing travel for planned special events include *achieving predictability*, *ensuring safety*, and *maximizing efficiency*. Table 69 states performance objectives, for the previously defined classes of transportation system users, applicable to satisfying the overall goal of operations efficiency and safety. In meeting these performance objectives, the event planning team must target the goal of achieving predictability during the event operations planning phase. Table 70 presents common, easy-to-measure measures of effectiveness (MOEs) for assessing the performance objectives that describe traffic operations. The event planning team should consider field studies to quantify existing MOEs at key roadways and intersections to calibrate capacity analysis software and computer simulation models applied during traffic management plan development. The identified MOEs represent day-of-event performance evaluation data, useful for post-event evaluation and future event reference.

## Planning Schedule and Deliverables

Two deliverables, produced by the event planning team during the event operations planning phase, include the *feasibility study* and impact mitigating *traffic management plan*. *Travel demand management* represents a key component of the overall process when forecasted traffic demand levels approach or exceed available roadway capacity. The previous chapter outlined a detailed special event permit process and identified advance planning deadlines applicable to the event organizer. Figure 20 illustrates a high-level event operations planning schedule for an event planning stakeholder group. The figure lists advance planning activities and potential stakeholder meetings and public hearings in a timeline relative to the planning deliverables. The schedule indicates other stakeholder planning initiatives, such as the development of a specialized transit plan to reduce event traffic demand. The event planning team should obtain a completed special event permit application and commence work on the event feasibility study no later than 60 days prior to the event. The team should start developing the event traffic management plan and obtain all initial public input and recommendations no later than 30 days before the event. The

| USER CLASS | PERFORMANCE OBJECTIVE |
|---|---|
| Event patron | • Minimize travel delay to/from the event.<br>• Minimize conflicts between pedestrians and vehicles.<br>• Minimize travel safety hazards.<br>• Minimize impact of traffic incidents.<br>• Disseminate accurate, timely, and consistent traveler information.<br>• Increase automation of traffic control.<br>• Maximize site access service flow rates. |
| Non-attendee road user | • Minimize travel delay on major thoroughfares, freeways and major arterials.<br>• Minimize impact on commuter and trucker travel time reliability.<br>• Maintain required parking and access for local residents and businesses.<br>• Maintain unimpeded access for emergency vehicles. |
| Transit user | • Maintain scheduled travel times.<br>• Minimize transit bus dwell times.<br>• Maintain required transit station parking for non-attendee transit users. |

**Table 69**
**Transportation System Operations Performance Objectives for Planned Special Events**

| LOCATION | MEASURE OF EFFECTIVENESS |
|---|---|
| Venue parking areas | • Arrival and departure service rate<br>• Time to clear parking lots |
| Intersections | • Vehicle delay<br>• Queue length |
| Freeways and surface streets | • Travel time and delay<br>• Traffic volume<br>• Traffic speed<br>• Number and location of crashes and other incidents<br>• Traffic incident clearance time |

**Table 70**
**Measures of Effectiveness for Assessing Performance Objectives**

event planning team should set aside the final 14 days prior to the event for training and implementation activities in addition to event information dissemination. The planning schedule provides a generic timeline, recognizing that actual event operations planning schedules vary considerably. For instance, some major, roving planned special events, such as the U.S. Golf Open, require an event operations planning phase spanning more than one year.

## Public Outreach

The public represents individual residents, businesses, and associated community groups. Street use events or other planned special events that take place at venues located adjacent to residential and/or commercial districts may significantly impact non-attendee mobility and community quality of life. Specific neighborhood impact issues include heavy traffic demand on local streets and event patron use of available local on-street parking. These issues arise because, in some instances, event patrons may find on-street parking in residential neighborhoods and business districts affords more convenient ingress and egress. In addition, illegal parking fines may not exceed, or significantly exceed, the fee charged at designated venue parking areas. The administrative team and event planning team should enact strategies to mitigate potential neighborhood traffic and parking impacts either in the strategic planning phase or early in the event operations planning phase.

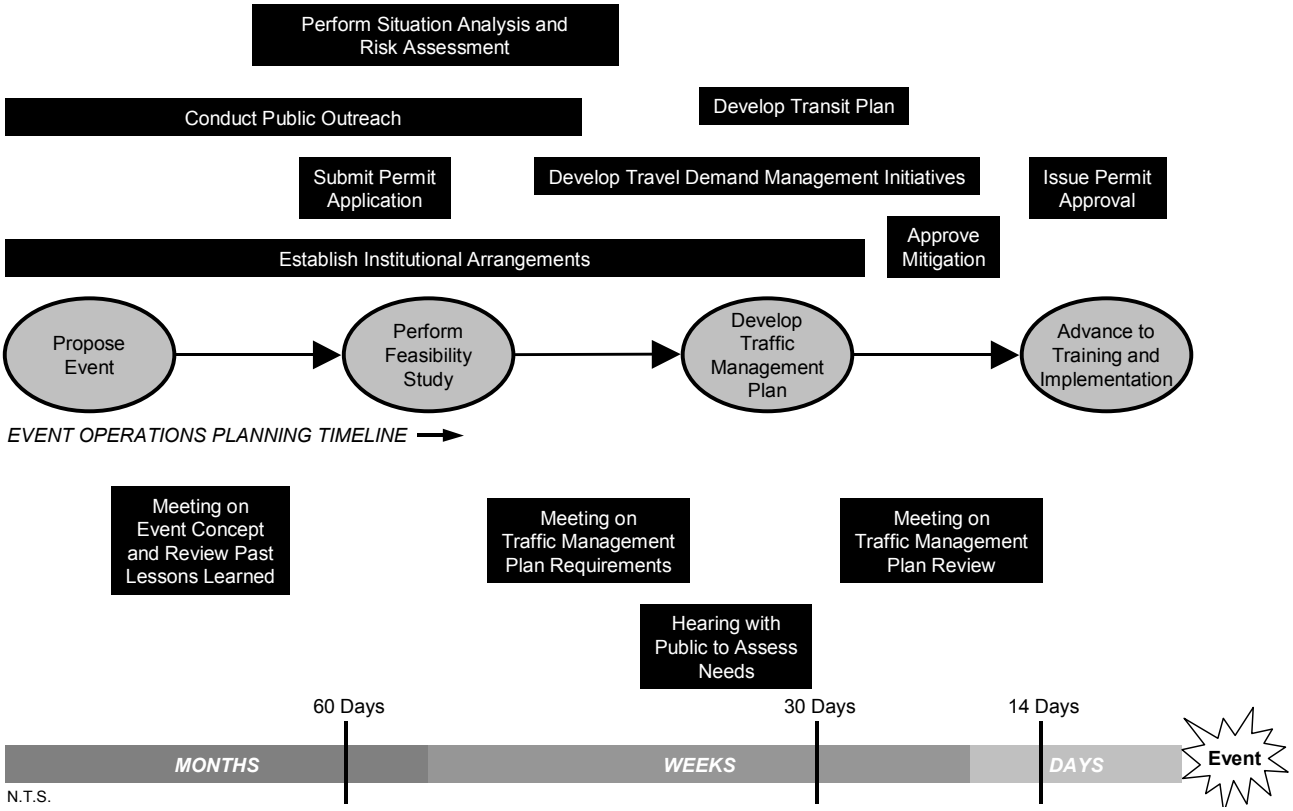


**Figure 20.**
**Event Operations Planning Schedule**

Initiation of public outreach efforts includes stakeholders, such as a traffic operations agency or law enforcement, holding monthly or bi-monthly meetings with community groups and local elected officials (e.g., city/village aldermen). Stakeholders and the public must first conduct a needs assessment based on a review of current neighborhood traffic and parking restrictions and the traffic management plan deployed during past planned special events. The balance of this section highlights innovative strategies developed by the cities of Seattle and Chicago to minimize neighborhood traffic and parking impacts during discrete/recurring events at a permanent venue. It should be recognized that an event planning team can implement these strategies on a temporary basis for less frequent continuous events and street use events.

City of Seattle

Due to the construction of a new football stadium, the Seattle Seahawks moved their scheduled 2000 and 2001 home games to the University of Washington's Husky Stadium. Recognizing the Seahawks represented a new and different stadium user with unique characteristics, the City of Seattle required development of a Seahawk Football Transportation Management Program[21]. The City of Seattle DOT, Seahawks organization, University of Washington, neighboring residents, and other City of Seattle officials conducted formal meetings prior to and during the Seahawks football season to listen to

community concerns, report on operations, develop plan modifications, and review performance goal achievement. A hotline was established for local residents to voice concerns and to communicate day-of-event observations. Stakeholders responded by developing carpool parking pricing incentives and establishing new *restricted parking zones (RPZ)* in residential neighborhoods adjacent to Husky Stadium. The number of parking enforcement officers assigned to patrol the RPZs on the day-of-event increased from 6 to 13, and the Seattle Municipal Court approved an RPZ violation fine increase from $28 to $44 (although a $71 fine was initially proposed). Table 71 notes specific performance goals established by the event planning team to evaluate roadway system performance objectives for the 2000 Seattle Seahawks football season.

Safeco Field, home to baseball's Seattle Mariners, was constructed in 1999 and borders three neighborhoods. Recognizing the residential and business needs of these neighborhoods, the City of Seattle developed an Inaugural Season Transportation Management Program (TMP) for events at the stadium venue[35]. Participating stakeholders set the following TMP goal:

*The primary goal, first and foremost, is reducing the number of vehicles, drive-alone and otherwise, associated with game attendance, thereby deflecting the traffic and parking impacts from the adjacent destination neighborhoods and the regional transportation system as a whole. The goals, which are stepped according to the kinds of and anticipated attendance, are expressed in vehicles per thousand attendees.*

The Mariners organization, City staff, and the public formed the event planning team charged with developing the TMP. The stakeholders focused on meeting numerous performance-based traffic demand mitigation requirements, varying by type of event and attendance levels, set by the Seattle City Council upon issuing a stadium master use permit. First year operation performance goals for Mariner's baseball games ranged from 330 (sell-out) to 345 vehicles per 1000 attendees. The permit specified third year operation and beyond performance goals ranging from 275 (sell-out) to 325 vehicles per 1000 attendees. A top priority for the TMP concerned deflecting special event parking impacts on the surrounding neighborhoods to the Seattle Central Business District. Table 72 lists specific measures considered by City officials to minimize on-street parking by event patrons in adjacent neighborhoods.

| GOAL | MEASURE | MEASURED PERFORMANCE | GOAL MET? |
|---|---|---|---|
| Travel reduction | No more than 195 cars/1000 attendees | 182 cars/1000 attendees | Yes |
| Travel time | Within 5% of Husky game travel times | -0.1% to 4.7% different than for Husky games | Yes |
| Duration of post-game traffic | Equal to or less than after Husky games | 35 minutes less | Yes |

**Table 71**
**Seahawk Football Transportation Management Program Goals and Objectives[21]**

| PARKING MANAGEMENT OPTION |
|---|
| • Extend parking meter enforcement hours (until at least 10 p.m. and on Sundays).<br>• Replace existing meters with smart meters (programmable by season, allowing extended hours during baseball season, for instance).<br>• Impose time limits on parking after 6 p.m. with signs (rather than extend meter hours, place 2 hour limits on metered spaces after 6 p.m. and on Sundays).<br>• Impose time limits on parking after 6 p.m. with meter hoods.<br>• Enforce parking restrictions 7 days per week (8 a.m. to 6 p.m. on Sundays).<br>• Add new parking meters.<br>• Reduce parking meter duration limits (change some 2 hour meters to 1 hour or less).<br>• Replace 4 hour and unrestricted spaces with 2 hour spaces.<br>• Refine role of City's enforcement officers (add community/public relations function).<br>• Assess higher fines for parking infractions in the ballpark neighborhoods.<br>• Increase enforcement (additional parking enforcement officers on game days; multiple ticketing).<br>• Create residential parking zones.<br>• Increase number and/or size of loading zones.<br>• Create business parking zones.<br>• Discontinue access restrictions that temporarily remove on-street parking (before and after events).<br>• Discontinue parking prohibitions for stadium access (before, during, and after events).<br>• Parking space delineation in non-metered areas. |

**Table 72**
**Measures Considered in Developing a Neighborhood Parking Management Plan for Seattle's Safeco Field[35]**

City of Chicago

The City of Chicago DOT maintains a *Resident Parking Permit Program* to preserve legal on-street parking for residents of neighborhoods surrounding U.S. Cellular Field during all Chicago White Sox baseball games[36]. For residents living within the program area, the City issues one resident parking permit per registered vehicle in addition to one guest permit per resident. The City also makes available guest parking permits for area businesses and churches to allow customers and congregation members to park in legal on-street parking spaces and gain access to off-street business/church parking within the program area. Figure 21 shows a sign enforcing the Resident Parking Permit Program. The City has a similar permit program in place for neighborhoods surrounding Wrigley Field, home to baseball's Chicago Cubs.


**Figure 21**
**Chicago Resident Permit Parking Program Enforcement**

## Mitigation Assessment and Approval

The previous chapter summarized various criteria for planned special event permit approval. However, as indicated in Figure 20, the event operations planning phase includes intermediate and final review periods for the event feasibility study and traffic management plan. Stakeholder review concentrates on the identification and proposed mitigation of event travel impacts. Effective and rapid stakeholder review of event operations planning products requires: 1) An annotated planning timeline, 2) A review mechanism, and 3) Performance standards.

In cases where an event planning team collectively develops a feasibility study, traffic management plan, and associated mitigation strategies, an annotated planning timeline proves effective for monitoring team progress. The Wisconsin DOT found such a tool useful for tracking specific traffic management planning and infrastructure deployment activities required to prepare for the opening of Miller Park in Milwaukee. The agency maintained a responsibility matrix listing each action item, the stakeholder responsible, the due date, and the present deployment status. An event planning team should establish an annotated planning timeline early in the event operations planning phase and use the tool to guide subsequent team meeting agendas as stakeholders develop event impact mitigation strategies and tactics.

Adopting a formal review mechanism reduces unnecessary delay in producing event operations planning deliverables required to stage a planned special event. The review mechanism should feature the administrative team serving as oversight to the event planning team. The administrative team typically consists of mid-to-upper level representatives of transportation agencies and law enforcement in addition to elected officials and ranking officials of other public agencies. A regional coalition may assume the duties of an administrative team. Under a formal review mechanism, an event planning team may seek administrative team approval of a feasibility study scope or conceptual traffic management plan prior to commencing work on the final deliverable. Both stakeholder groups interact again to review feasibility study results and final traffic management operations plans. Some jurisdictions have a *champion* charged with resolving institutional and operations issues affecting travel management for planned special events. These champions have the position to mitigate issues hampering the event operations planning process. Therefore, they should administer the review mechanism. Jurisdictions should have an alternate official ready to replace the current champion should that person resign from present duty.

This chapter included a review of various transportation system operations performance objectives and associated measures of effectiveness that stakeholders may use to monitor system performance on the day-of-event and, in turn, evaluate travel management efforts. During the event operations planning phase, stakeholders must set and agree to performance standards used to assess traffic impact mitigation proposals. These performance standards typically represent level of service (LOS) measures applicable to freeway and surface street segments, freeway junctions, and roadway intersections. Stakeholders assigned to develop mitigation strategies or review planned special event impacts on traffic should reference jurisdiction Traffic Impact Study guidelines defining accepted LOS thresholds. The LOS thresholds likely

| INSTITUTIONAL ARRANGEMENT | EXAMPLE APPLICATION |
|---|---|
| Interagency agreement | • Joint operations policy between stakeholders that establishes a shared role regarding event operations planning and day-of-event travel management.<br>• Memorandum of understanding defining stakeholder roles and responsibilities.<br>• Mutual-aid agreement facilitating resource sharing and/or reimbursement for services. |
| Standard street use event routes | • Routes established under the strategic planning phase for recurring street use events such as parades and races. |
| Toll facility congestion policy | • Suspension of tolls during periods of heavy congestion. |
| Public-private towing contract | • On-call towing and recovery services during a special event. |

**Table 73**
**Summary of Institutional Arrangements**

| ELEMENT |
|---|
| • Advance planning duties and responsibilities |
| • Day-of-event duties and responsibilities |
| • Organization |
| • Resource sharing |
| • Funding reimbursement mechanisms |

**Table 74**
**Elements of Interagency Agreements**

vary by roadway classification. In urban and metropolitan areas, jurisdictions may deem an LOS D, describing *high-density stable flow*, acceptable for freeways, arterials, and major intersections. Similarly, an LOS C, describing *stable flow*, may represent the allowable threshold for local surface streets and intersections. Small urban and rural areas may have more stringent requirements. Jurisdictions may relax their performance standards and allow LOS E operation, describing *unstable capacity flow*, on major roadway facilities for infrequent planned special events.

## Institutional Arrangements

Table 73 summarizes four types of institutional arrangements involving stakeholders responsible for event operations planning and/or day-of-event operations. Interagency agreements include a joint operations policy, memorandum of understanding, or mutual-aid agreement between two or more stakeholders. Table 74 indicates elements of interagency agreements. Appendix C contains an Illinois and Washington State joint operations policy, between state DOT and state police, that covers special event planning[37,38]. Stakeholders may also strike an interagency agreement, during the event operations planning phase, applicable to a specific planned special event.

The development and use of standard street use event routes reduces the level and complexity of event operations planning tasks and overall planning time. In establishing such standard routes for parades and/or street races, stakeholders ensure maximum benefit to the event and minimum impact to surrounding neighborhoods and business districts. The routes specify appropriate event starting and ending points coupled with staging areas for participant gathering and dispersing. Use of a standard street use event route offers numerous advantages. This includes reusing traffic management and operations plans, with minor modifications as necessary. Therefore, event organ-

izers and traffic management team stakeholders realize a cost savings. The event planning team can develop standard signs, specific to the event route and associated alternate routes for background traffic that may be reused for future street use events. Standard routes allow event patrons and non-attendee road users to become familiar with traffic patterns during recurring street use events, thus minimizing potential traffic problems on the day-of-event.

Suspension of toll collections on turnpikes and other toll facilities during periods of heavy congestion represents a new policy concept aimed at reducing congestion and the occurrence of traffic incidents at toll plazas. A toll facility congestion policy represents a bottleneck mitigation strategy applicable to planned special events and other sources of congestion. A West Virginia Turnpike policy, enacted in December 2002, allows Turnpike officials to open toll plazas for 15 minutes any time vehicle queues extend at least three miles upstream of the plaza. After the 15-minute period ends, officials can determine whether the queue dispersed or if another 15-minute period is required. Under normal operations, Turnpike officials estimate that a vehicle joining a three mile queue takes approximately 15 minutes to pass through a toll plaza. Officials noted 15 minor crashes occurred on the Sunday after Thanksgiving in 2002, the Turnpike's busiest day of the year[39]. State legislators in Maryland debated a proposed bill in 2003 to create a similar policy for the Chesapeake Bay Bridge[40]. The bill specifies suspending tolls if a traffic queue extends more than five miles upstream of the toll plaza and is moving at less than 30 miles per hour. The increasing deployment of electronic tolling may obviate the need for these strategies in the future.

Private towing companies perform a specific functional activity in traffic incident management, that is, removal of disabled or wrecked vehicles, spilled cargo, and debris from an incident site. Law enforcement and traffic operations agencies alike have recognized the indispensable role private towing companies have in effecting incident removal and restoring the affected road section back to normal operation. Public agencies commonly enter into agreements with one or more commercial towers to secure on-call traffic incident clearance services, or at a minimum, the agencies maintain a contact list of local private towing companies. Traffic incident management represents a key consideration in event operations planning. Event planning team stakeholders may establish event-specific public-private towing contracts to secure *on-site* towing and recovery services. The City of Cincinnati has established, under the City rules and regulations for police rotation wreckers, a *special event tow* category[41]. The City defines a special event tow as "when tow operator remains with police officer for a specified period of time towing or moving vehicles as need arises." The City regulation specifies a special event tow rate of $20.00 per tow or $35.00 per hour, whichever is greater.

# FEASIBILITY STUDY

## Overview

The structure and approach of a planned special event feasibility study resembles a *Traffic Impact Study* required for planned developments, as illustrated in Figure 22. The figure shows the sequential steps in

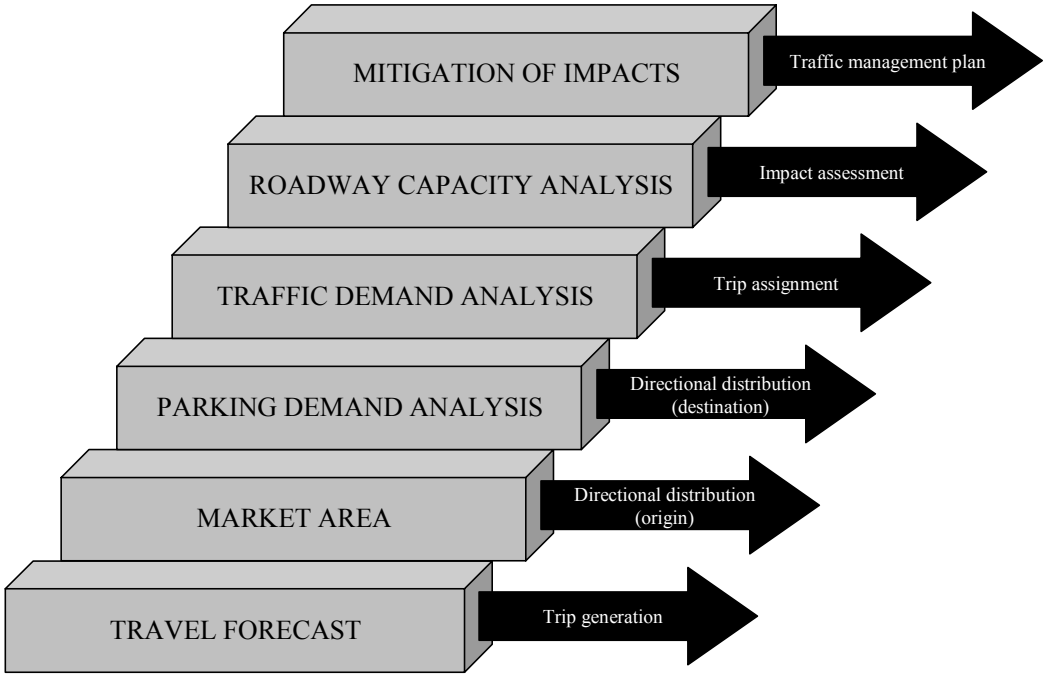


**Figure 22.**
**Feasibility Study Analysis Steps**

preparing a feasibility study for a planned special event. Table 75 provides an overview of the five feasibility study components. The accuracy of one analysis influences that of another. *Achieving predictability*, a goal of managing travel for planned special events, represents the focus of a feasibility study effort.

The feasibility study gauges the impact a proposed event has on traffic and parking operations at and in the vicinity of the venue initially *without* roadway capacity improvements or initiatives to reduce travel demand. The feasibility study results define the scope of traffic management plan required to successfully manage travel for a planned special event.

## Travel Forecast

Travel forecast analysis involves estimating: 1) Modal split, 2) Event trip generation, and 3) Traffic arrival rate. Event planning team stakeholders that typically collaborate on this analysis include a traffic operations agency, traffic engineering consultant, transit agency, and event organizer. The event organizer supplies key input data regarding event operation. The transit agency assists in estimating modal split. The traffic operations agency or traffic engineering consultant performs the analysis, and either stakeholder may hold or research historical traffic and parking operations on similar planned special events.

| COMPONENT | ANALYSIS | RESULT | APPLICATION |
|---|---|---|---|
| Travel forecast | • Modal split | • Number of trips by mode of travel | • Input into parking demand analysis.<br>• Input into traffic demand analysis. |
| | • Event trip generation | • Number of trips | |
| | • Traffic arrival rate | • Number of trips per unit of time | |
| Market area | • Event trip origin | • Geographic location of event trip origins and percent split | • Input into traffic demand analysis. |
| Parking demand analysis | • Background parking occupancy | • Number of non-attendee vehicles per parking area and unit of time | • Input into event parking occupancy. |
| | • Event parking occupancy | • Number of event-generated vehicles per parking area and unit of time | • Input into traffic demand analysis. |
| Traffic demand analysis | • Background traffic flow | • Background traffic demand rate, adjusted for event-required road closures | • Input into roadway capacity analysis. |
| | • Event trip assignment | • Event traffic demand rate per assigned route | |
| Roadway capacity analysis | • Section and point capacity | • Identification of capacity constraints and level of service | • Input into traffic management plan.<br>• Input into travel demand management assessment. |
| | • Network operations | • Identification of bottleneck locations and saturation flow rates | |

**Table 75**
**Feasibility Study Analysis Summary**

Modal Split

Under the scope of a feasibility study, modal split concerns identifying the existing modes of travel event patrons will use to access the event venue site. Common travel modes include auto, public transit, and walking. Public transit refers to scheduled bus transit or commuter rail. Illustrated in figure 23, some patrons of the 1986 and 1995 U.S. Golf Open in rural Southampton, NY found the Long Island Railroad commuter rail service an efficient and convenient mode of travel to/from Shinnecock Hills Country Club. To assure consideration of appropriate roadway mitigation, transportation operations planners analyzed a range of modal spilt percentages in the feasibility study to account for various scenarios. Commuter rail or other people

**Figure 23**
**Commuter Rail Modal Split**

mover systems exist in several metropolitan areas across the Nation and usually provide regular service to city stadium and arena venues. Transit availability includes scheduled charter bus service operating from other cities, suburban park and ride lots, or city neighborhoods.

Table 76 lists surveyed modal splits for discrete/recurring events at permanent venues in San Francisco, New York, and San Diego. The baseball stadium venues in San Francisco and New York have excellent scheduled transit service, including commuter rail. Stadiums located in suburban areas, such as Qualcomm Stadium in San Diego, and rural areas generally have a high auto split. Travel time, travel convenience, parking accessibility and cost weighs significantly on an event patron's decision to drive or utilize an alternate mode of travel. This likely represents another contributor to the high transit spilt in the San Francisco example, where Pacific Bell Park resides adjacent to the downtown area. Other modes of travel include bicycle and taxi.

Walking trips deserve consideration in modal split estimates for planned special events occurring at downtown venues. Practitioners must consider the proximity of employment centers, residential developments, and hotels to a planned special event venue before dismissing walking as a viable travel mode. Venues located on university campuses typically draw a measurable percentage of walking trips. Surveys for college football games have reported as many as 10 to 25 percent of event patrons arriving by foot[45].

| EVENT | ATTENDANCE | MODE OF TRAVEL | | | |
|---|---|---|---|---|---|
| | | AUTO | TRANSIT | WALKING | OTHER |
| San Francisco Giants weekday baseball game – August 2000[42] | 38,000 – 41,000 (capacity 41,000) | 48% | 41% | 8% | 3% |
| San Francisco Giants weeknight baseball game – August 2000[42] | 38,000 – 41,000 (capacity 41,000) | 50% | 37% | 7% | 6% |
| San Francisco Giants weekend baseball game – August 2000[42] | 38,000 – 41,000 (capacity 41,000) | 58% | 34% | 5% | 4% |
| New York Mets weeknight baseball game – June 1997[43] | 18,000 (capacity 56,500) | 59% | 41% | -- | -- |
| San Diego Padres weekday baseball game – April/May 1998[44] | Unknown | 85% | 12% | -- | 3% |
| San Diego Padres weeknight baseball game – April/May 1998[44] | Unknown | 95% | 5% | -- | -- |
| San Diego Padres weekend evening baseball game – April/May 1998[44] | Unknown | 85% | 12% | -- | 3% |

**Table 76**
**Example Modal Split for Discrete/Recurring Events at Permanent Venue**

Practitioners can best obtain measured data on planned special event modal split through conducting a survey of event patrons. Appendix D contains an Internet-based event patron evaluation survey for those attending the 2002 Fair Saint Louis festival. In addition to querying event patrons on mode of travel, obtaining origin location information (e.g., zip code) assists event planning team stakeholders configure transit schedules or charter bus services for future similar events.

Event Trip Generation

Unlike other traffic generators such as commercial developments, planned special events practitioners typically have advance knowledge of event attendance and, in turn, can develop traffic generation estimates via vehicle occupancy factors. On the other hand, trip generation rates, based on event traffic volume or parking occupancy data, are not appropriate for transfer and application to special events. Too many variables exist with regard to event type, event logistics, event popularity, weather, and parking characteristics. Event operations and other external variables affect any application of historical data to future events.

Table 77 outlines a two-step process strategy for forecasting event trip generation. Input data includes a modal split estimate since the trip generation forecast aims to estimate the number of event-generated vehicles. In the absence of a daily attendance estimate, practitioners can use percentage of venue capacity as a base. However, many continuous events or street use events do not have a pre-specified venue capacity. Continuous events, such as fairs and festivals, often run for two or more days. Attendance generally fluctuates greatly from day to day, with Saturday operations yielding the highest daily attendance. A study of two-day (Saturday/Sunday) festivals in West Virginia indicated 58 percent of the total festival attendance was on Saturday[46]. The same study noted the following total event attendance distribution for three-day festivals: 20 percent on Friday, 50 percent on Saturday, and 30 percent on Sunday. It should be recognized that daily attendance reflects scheduled headline entertainment or other main festival events.

Vehicle occupancy drives an estimate of event-generated traffic. Table 78 lists average vehicle occupancy factors for select discrete/recurring events at permanent venue and continuous events. Venues with excellent transit service, such as the New York Mets' Shea Stadium, will have a reduced vehicle occupancy factor. A discrete/recurring event at permanent venue that occurs on the weekend will likely have a higher vehicle occupancy factor due to families and groups of tailgaters. A vehicle occupancy factor of 2.5 persons per vehicle represents a common assumption, however for forecasting purposes, practitioners should consider a range of factors from 2.2 to 2.8 depending on local conditions[43].

| COMPONENT | DETAIL |
|---|---|
| Input data | • Daily attendance • Percent auto trips • Vehicle occupancy factor |
| Method | ***Step 1.*** (Daily Attendance) x (Percent Auto Trips) = Person Trips Via Auto<br>***Step 2.*** (Person Trips) / (Vehicle Occupancy Factor) = Vehicle Trips |
| Result | • Number of vehicle trips by auto either to or from the event |

**Table 77**
**Trip Generation Forecast Process**

| EVENT | ATTENDANCE | AVERAGE VEHICLE OCCUPANCY |
|---|---|---|
| *Discrete/Recurring Event at Permanent Venue* | | |
| San Francisco Giants baseball games – August 2000[42] | 38,000 – 41,000 (capacity 41,000) | 2.8 persons per auto |
| Anaheim Angels weeknight baseball game – July 1997[43] | 18,197 (capacity 37,000) | 2.6 persons per auto |
| Cleveland Indians Saturday baseball game – July 1997[43] | 43,070 (capacity 43,368) | 2.64 persons per auto |
| New York Mets weeknight baseball game – June 1997[43] | 18,000 (capacity 56,500) | 2.31 persons per auto |
| San Diego Padres weekday baseball game – April/May 1998[44] | Unknown | 2.3 persons per auto |
| San Diego Padres weeknight baseball game – April/May 1998[44] | Unknown | 2.5 persons per auto |
| San Diego Padres weekend evening baseball game – April/May 1998[44] | Unknown | 3.0-3.1 persons per auto |
| Denver Broncos football games – 1998/2001[13] | 76,000 | 3.0 persons per auto on-site; 2.3 persons per auto off-site |
| *Continuous Event* | | |
| 1997 Stonewall Jackson Heritage Arts & Crafts Jubilee - West Virginia[46] | 45,000 to 50,000 (four-day total) | 2.46 persons per auto |
| 1997 West Virginia Honey Festival[46] | 6,000 (two-day total) | 2.15 persons per auto |
| 1997 West Virginia Wine & Jazz Festival[46] | 3,500 (two-day total) | 2.42 persons per auto |
| 22nd Mountain Heritage Arts & Crafts Festival – West Virginia[46] | 25,000 (three-day total) | 2.30 persons per auto |

**Table 78**
**Example Planned Special Event Vehicle Occupancy Factors**

Traffic Arrival Rate

Traffic arrival and departure rate indicates the peak period (e.g., hour or 15 minute) of event-generated traffic. The rate specifies two key parameters serving as direct input into the traffic demand analysis. That is, peak period time and percent of total event-generated traffic within the peak period. This section focuses on estimating the traffic arrival rate. Traffic arriving to an event can potentially cause greater impacts to background traffic mobility than event departure traffic. This is attributed to arrival traffic typically traveling from high-capacity roadway facilities (e.g., freeways and arterials) to low-capacity facilities (e.g., venue access roads). Roadway system bottlenecks that happen during event ingress may create queue spillbacks to freeways and major surface streets, thus impacting background traffic. Drivers departing an event venue site generally have little or no choice of exit routes. Roadway capacity constraints include freeway entrance ramps and turning movements to arterials and other major collector roadways. Departing traffic queues are constrained to the venue access roadway and spillback into the parking areas. Figure 24 shows traffic operations following a San Diego Chargers football game at: 1) A freeway entrance ramp, 2) A venue access road upstream of a freeway, and 3) An on-site venue parking area.

**Figure 24**
**Event Patron Departure from a Discrete/Recurring Event at Permanent Venue**

Table 79 indicates traffic arrival rates and time of peak arrival for select discrete/recurring events at permanent venue and continuous events. Time of arrival depends on audience accommodation (e.g., general admission or reserved seating) and/or the nature of pre-event activities. Such activities include tailgating or practices. Figure 25 illustrates NASCAR pre-race preparations that attract a significant number of event patrons well before the event start.

As illustrated in table 79, the traffic arrival rate for sporting games and concerts peaks within one hour of the event start. Due to high traffic arrival concentration, practitioners may consider estimating a peak 15-minute traffic arrival rate and associated peak hour factor for roadway capacity analysis. With regard to continuous events, peak traffic arrival rate generally occurs immediately prior to the event start. Since event patrons do not place a high priority on meeting a continuous event start time, the concentration of continuous event arrivals is relatively low compared to other event types. The peak level of event-generated traffic demand may occur during the middle of a continuous event operating period when both event arrival and departure traffic traverse the roadway system as patrons come and go from the event.

Practitioners may use event patron travel surveys in addition to historical event-generated traffic volume and/or parking occupancy counts to estimate the traffic arrival rate and peak time of occurrence. It should be noted that weather conditions, particularly for continuous events and street use events, may significantly skew data. Thus, practitioners must exercise great care when developing future event estimates from historical data.

## Market Area

A market area analysis identifies the origins of trips to a planned special event coupled with the destination of trips from an event. The analysis focuses on developing a regional directional distribution of auto trips to/from an event venue site, where the site refers to the collective parking areas serving the venue. A regional directional distribution specifies: 1) The freeway and arterial corridors serving the venue site and 2) The percent split and volume of event-generated auto trips traversing each corridor. Appendix E contains a regional directional distribution prepared for the NASCAR Kansas 400 race[47].

| EVENT | ATTENDANCE | EVENT START | SITE OPEN | PEAK TRAFFIC FLOW OCCURRENCE |
|---|---|---|---|---|
| *Discrete/Recurring Event at Permanent Venue* | | | | |
| 2001 NASCAR Kansas 400[47] | 100,000+ | 12:00 P.M. | 6:00 A.M. | 8:00 A.M. |
| Anaheim Angels weeknight baseball game – July 1997[43] | 18,197 (capacity 37,000) | Evening | 2+ hours before first pitch | 1 hour before first pitch (82% of arrivals – 29% peak 15 minutes) |
| Cleveland Indians Saturday baseball game – July 1997[43] | 43,070 (capacity 43,368) | Afternoon | 2+ hours before first pitch | 1 hour before first pitch (67% of arrivals – 19% peak 15 minutes) |
| New York Mets weeknight baseball game – June 1997[43] | 18,000 (capacity 56,500) | Evening | 2+ hours before first pitch | 1 hour before first pitch (62% of arrivals – 16% peak 15 minutes) |
| *Continuous Event* | | | | |
| Louisiana World Exposition in New Orleans – weekday August 1984[48] | 35,700 | 10:00 A.M. | -- | 31% of event patrons arrived by 11:00 A.M. |
| Louisiana World Exposition in New Orleans – Saturday in August 1984[48] | Unknown | 10:00 A.M. | -- | 29% of event patrons arrived by 11:00 A.M. |

**Table 79**
**Example Planned Special Event Traffic Arrival Rate Characteristics**

**Figure 25**
**Pre-Event Activity**

Table 80 summarizes three analysis methods used to define a planned special event market area. Practitioners can apply a travel time analysis or distance analysis to estimate the market area for any planned special event. Continuous events or street use events that do not offer advance ticket sales typically require a market analysis based on travel time or distance and referencing area population distribution.

| METHOD | DESCRIPTION |
|---|---|
| Travel time analysis | • Determine population distribution within travel time threshold of event venue. |
| Distance analysis | • Determine population distribution within distance radius of event venue. |
| Origin location analysis | • Determine weighted distribution of known origins by place or zip code. |

**Table 80**
**Market Area Analysis Methods**

Figure 26 illustrates an example travel time analysis for a downtown Chicago lakefront fireworks display. A geographic information system or other mapping software tool can create travel time zones, as shown in the figure, based on user-defined thresholds. Multiple travel time zones allow users to perform a weighted analysis of population distribution. Practitioners should categorize area population within each travel time zone by zip code or, for a 15 minute threshold or less, by census tract. Any geographic information system and most mapping tools generate spreadsheets identifying all spatial population categories within each travel time zone. Using the spreadsheet, practitioners can assign a freeway or arterial corridor, serving the event venue site, to each defined population category. The population distribution among roadway system corridors constitutes the regional directional distribution for the planned special event. Practitioners can also incorporate Census socioeconomic data into an analysis as necessary.


**Figure 26**
**Example Travel Time Analysis**

The described travel time analysis methodology applies to a distance analysis as well. Instead of travel time thresholds, users define distance thresholds. Practitioners should exercise care in developing a planned special event market area by travel time or absolute distance to the event venue site. In the case of continuous events or street use events, the market area must incorporate only the community or region the event is staged for. Discrete/recurring events at permanent venue, such as professional/major college sporting events or major concerts, warrant an expanded market area. In addition, a travel time or distance analysis for these events should not reflect a sensitivity to travel time or distance at the city/suburb level. In other words, an event patron located in a city suburb typically does not factor travel time into a decision to attend a professional or major college sporting event at a downtown venue.

An origin location analysis represents the most accurate method for developing an event-specific regional directional distribution. This analysis utilizes a statistically significant database of event patron travel origins. Input data includes advance or season ticket holder place of residence (e.g., place or zip code) or place of trip origin obtained through a past/similar event travel survey. An event economic impact study also indicates the cities or regions patrons will arrive from. A discrete/recurring event at permanent venue requires ticket sales, and event organizers initiate ticket sales weeks and even months in advance of the event. But, event organizers or ticket sales companies may consider customer information confidential or proprietary.

An event patron travel survey (see Appendix D) proves effective in determining the exact origin of a patron trip to a planned special event. For instance, weekday events may attract a significant percentage of non-home-based trips as event patrons arrive from work. A survey of patrons attending weeknight baseball games at Pacific Bell Park in

San Francisco indicates 28 percent of patrons come from work[42]. An event patron travel survey captures this critical information. Event patron departures from the event venue site typically involve home as a destination.

Practitioners performing an origin location analysis determine a geographical distribution of event patron origins. In turn, this distribution defines the freeway and arterial corridors that event patrons will use to access the event venue site in addition to a traffic distribution. An origin location analysis applies to all planned special events.

## Parking Demand Analysis

A parking demand analysis functions to inventory the scope of required parking for event patrons in the vicinity of the event venue. A parking occupancy study drives the overall analysis and determination of event parking areas. This study indicates the level of parking spaces occupied, relative to lot capacity, at intermittent time intervals.

Figure 27 presents a parking demand analysis process strategy used to determine the adequacy of event venue (on-site) parking and the identification of appropriate off-site parking areas. The flowchart denotes an analysis conducted for one time interval. Practitioners should perform an iterative parking demand analysis, over hourly time periods as necessary, if considering parking areas characterized by high background parking turnover.

Examination of on-site parking areas must account for spaces lost to the event sponsors, bus staging, limousine and taxi staging, media parking, event employee parking, and event participant parking. Net parking supply incorporates event staging needs and any background traffic that can legally use the parking area during event hours of operation. In order to conceptually measure parking supply within a non-striped area, assume 150 cars per acre as a rule of thumb[49]. The travel forecast analysis yields an estimate of parking demand by quantifying the anticipated number of event-generated auto trips. Aside from continuous events, practitioners should perform a parking demand analysis that accounts for maximum event-generated parking demand.

In evaluating parking supply versus demand, consider as a rule of thumb that 90 to 95 percent lot occupancy represents a full parking area[9]. This especially applies under scenarios where event patrons must self-park. When a parking area reaches a near-capacity occupancy level, drivers experience difficulty locating an empty parking space and must circulate through the lot again or seek another parking area. Continuous events and street use events often utilize self-park areas.

Overflow parking areas comprise both on-street parking and public/private off-street parking areas, located off-site but in the immediate vicinity of the event venue. Figure 28 shows a designated off-street parking area, as noted by a light post banner, for the Summerfest music festival in downtown Milwaukee, WI. Identification of off-site parking areas depends on walking distance to the event venue. For example, a 15 minute walking time threshold allows consideration of off-street parking areas within 3,600 feet of an event venue, assuming a pedestrian walking speed of 4 feet per second. Parking areas located further from the venue would require a continuous shuttle service.

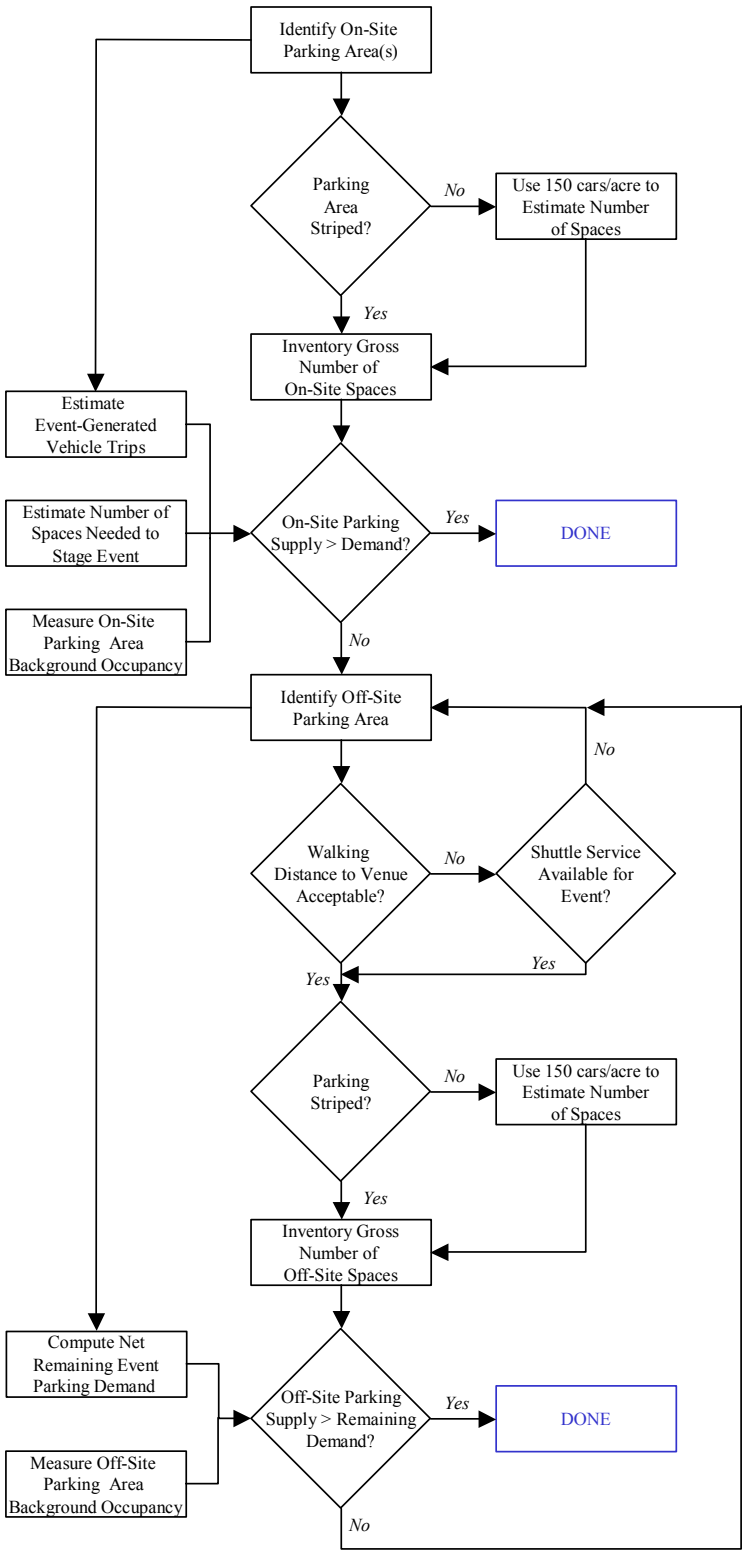


**Figure 27**
**Parking Demand Analysis Process**


**Figure 28**
**Designated Event Off-Site Parking Area**

Figure 29 shows a parking occupancy summary for a regional/multi-venue event in downtown Denver, CO. The spreadsheet format conveniently organizes and presents occupancy estimates by time of day and day of week. A parking demand analysis for a regional/multi-venue event presents special challenges. Practitioners must synthesize the temporal parking requirements for each individual area event separately. Parking areas function under *shared parking* operation, servicing variable demand rates from different planned special events over the course of a day.

**Downtown Parking Summary w/ Coors Field**

| | Thursday | Friday | Saturday | Sunday |
|---|---|---|---|---|
| Total Spaces | 42,605 | 42,605 | 35,380 | 35,380 |
| Available Spaces | 10,651 | 10,651 | 30,073 | 30,073 |
| | | | | |
| % Occupancy w/ Event Overflow Parking Downtown and using Coors Field* | | | | |
| 10:00 | 75% | 73% | 7% | 14% |
| 11:00 | 80% | 79% | 17% | 41% |
| 12:00 | 93% | 84% | 38% | 57% |
| 1:00 | 94% | 84% | 51% | 68% |
| 2:00 | 94% | 84% | 55% | 83% |
| 3:00 | 94% | 78% | 52% | 92% |
| 4:00 | 90% | 73% | 59% | 75% |

Events included are Rockies game on Thursday and TOC/GP Fri-Sun

**Figure 29**
**Example Event Parking Occupancy Summary[9]**

## Traffic Demand Analysis

A traffic demand analysis determines a local area directional distribution and overall assignment of event-generated traffic. The local area directional distribution indicates freeway ramps and intersections, including turning movements, traversed by event-generated traffic arriving to or departing from a planned special event. Freeway and arterial corridors identified in a regional directional distribution quantify event patron trip origins, and the planned special event parking areas represent *sink nodes* or location of trip destination. Traffic assignment includes event-generated auto traffic, charter buses, limousines, and other vehicles transporting event patrons, participants, and event employees. Practitioners performing traffic demand analyses should possess a personal knowledge of the roadway system surrounding an event venue in addition to existing traffic conditions.

A parking demand analysis assesses event parking *sufficiency*. The analysis does not define local traffic patterns to/from individual parking areas. Practitioners, instead, must gauge the utility associated with drivers choosing individual parking areas. The key components comprising this utility include driving time, parking cost, and walking time[50]. The attractiveness of each lot varies by freeway or arterial corridor serving the event site, yet event patrons will accept a moderate increase in overall driving/walking time in exchange for a substantial parking cost savings. The event planning team and traffic management team must recognize such driver behavior and formulate appropriate traffic management strategies and tactics. Figure 30 illustrates one tactic, instituting on-street parking restrictions on the day-of-event. Pre-trip and en-route traveler in-

formation influences driver choice regarding parking selection.


**Figure 30**
**Local Area Planned Special Event Parking Restriction**

Traffic demand analysis includes developing composite background and event-generated traffic projections for all roadway system facilities serving the event venue. Composite traffic volumes expressed as an hourly (or sub-hourly) rate meet roadway capacity analysis input requirements. These rates identify the peak hour capacity analysis periods during event patron arrival or departure. Practitioners must adjust background traffic volumes to account for displaced traffic caused by required road closures to stage the planned special event. These road closures alter traffic patterns to/from commercial trip generators, residential areas, and places of worship. Displaced background traffic assignment involves identifying the shortest path alternate route that has excess capacity.

As a preliminary step to assess the need to perform a detailed roadway capacity analysis, draw a circular screen line (e.g., 0.5 to 1 mile radius) around the event venue site. Note each roadway segment intercepted by the screen line, and estimate the segment's capacity in each direction of travel. Create a chart of hourly composite traffic volumes for each identified segment, and assess capacity deficiencies in both directions of travel. Figure 31 shows a preliminary road segment capacity analysis conducted as part of a feasibility study for a regional/multi-venue event in Denver, CO.

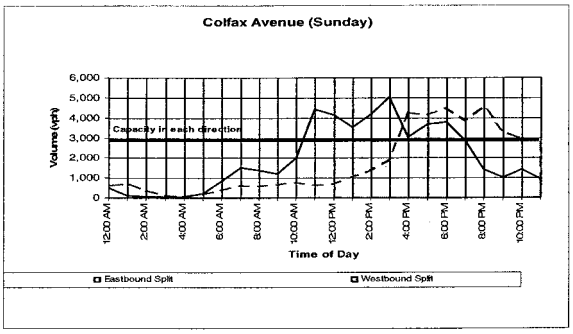


**Figure 31**
**Example Preliminary Road Segment Capacity Analysis[9]**

## Roadway Capacity Analysis

A roadway capacity analysis uses traffic demand analysis results to measure the impact of a proposed planned special event on roadway system operations. At the feasibility study level, a roadway capacity analysis references existing roadway facility operations and capacity (e.g., no reverse flow operation or other capacity enhancements). The analysis assumes pedestrian/vehicular conflicts do not exist, and parking area access points provide sufficient service flow rates. Regardless of capacity analysis outcome, pedestrian accommodation and parking management represent key considerations in a planned special event traffic management plan.

Roadway capacity analysis involves freeway segments, freeway junctions such as ramps and weaving areas, surface street segments,

signalized intersections, and unsignalized intersections. To evaluate these facilities, practitioners can employ one of two approaches: 1) Analyze section and point capacity or 2) Analyze network operations. The first approach pertains to applying Highway Capacity Manual (HCM) recommended capacity analysis methodologies to discrete locations in the study area. Practitioners scope roadway sections, freeway junctions, or intersections for analysis, then apply an appropriate HCM methodology to identify movement capacity constraints and measure operations level of service. The latter approach concerns utilizing a computer traffic simulation model to identify bottleneck locations, or *hot spots*, and associated saturation flow rates. Practitioners scope the size and detail of the simulation model network, and the model works to reveal operations deficiencies.

Computer traffic simulation models provide seamless analysis of traffic operations across a network of roadway segments and intersections. This proves particularly useful in analyzing a corridor of closely spaced traffic signals where signal coordination and vehicle spillback from adjacent intersections sharply impact traffic operations. Numerous macroscopic and microscopic simulation models exist, including the CORSIM microscopic computer traffic simulation model developed and supported by FHWA. CORSIM can interface component freeway (FRESIM) and arterial (NETSIM) simulation models. For example, it has the capability of showing a freeway entrance ramp bottleneck and the resulting queue spillback on adjacent surface streets (or vice versa). As shown in Figure 32, CORSIM also affords practitioners and event planning team stakeholders the opportunity to view an animation of simulated traffic operations.

**Figure 32**
**CORSIM Simulation Animation**

## Mitigation of Impacts

The mitigation of congestion and potential safety impacts identified through a feasibility study requires development of a traffic management plan and complementing travel demand management strategies. Table 81 lists numerous tools for mitigating planned special event impacts on local roadway and regional transportation system operations. In meeting the overall travel management goal of *achieving efficiency*, these tools target utilizing the excess capacity of the roadway system, parking facilities, and transit. Through travel demand management, event planning team stakeholders develop attractive incentives and use innovative communication mechanisms to influence event patron decision making and, ultimately, traffic demand. Chapter 6 and 7 detail impact mitigation strategies and tactics.

| CATEGORY | EXAMPLE TOOLS |
|---|---|
| *Traffic Control and Capacity Improvements* | |
| Freeway traffic control | • Ramp closures or additional capacity<br>• Alternate routes<br>• Ramp metering |
| Surface street traffic control | • Lane control<br>• Alternative lane operations<br>• On-street parking restrictions<br>• Trailblazer signing<br>• Parking management systems |
| Intersection traffic control | • Access restriction<br>• Advance signing<br>• Traffic signal timing and coordination<br>• Traffic signal systems |
| Traffic incident management | • Service patrols<br>• Tow truck staging<br>• Advance warning signs<br>• Portable lighting |
| *Traffic Management* | |
| Traffic surveillance | • Closed circuit television systems<br>• Field observation<br>• Aerial observation<br>• Media reports<br>• Portable traffic management systems |
| En-route traveler information | • Changeable message signs<br>• Highway advisory radio<br>• Media |
| *Travel Demand Management* | |
| Transit incentives | • Public transit service expansion<br>• Express buses from park and ride lots<br>• Charter bus service |
| High occupancy vehicle incentives | • Preferred parking<br>• Reduced parking cost |
| Event patron incentives | • Pre-event and post-event activities |
| Bicyclist accommodation | • Bicycle routes and available parking/lock-up |
| Local travel demand management | • Background traffic diversion<br>• Truck diversion |
| Pre-trip traveler information | • Internet<br>• Telephone information systems<br>• Public information campaign<br>• Event and venue transportation guide |

**Table 81**
**Tools for Mitigating Planned Special Event Impacts on Transportation System Operations**

# EXTERNAL FACTORS AFFECTING SCOPE OF EVENT IMPACT

## Available Resources and Weather

This chapter summarizes event operations planning and impact analysis activities that address the core factors affecting planned special event severity. That is, *travel demand*, *road/site capacity*, and *event operation*. A number of secondary factors warrant consideration in the event operations phase, such as available resources, weather, and concurrent planned events. These factors can greatly influence the level of impact a planned special event has on transportation system operations. By gaining an understanding of the special challenges certain external factors present to transportation management team stakeholders charged with managing travel for planned special events, the event operations team can develop appropriate contingency plans to mitigate infrequent but high-impact scenarios.

Available resources refer to the quantity of personnel and equipment available to plan for and conduct day-of-event travel management operations. Besides the size of a planned special event, the level of available resources depend on time/place of occurrence, other planned special events, and equipment status. Shown in figure 33, venue reconstruction places additional demand on the amount of traffic management team personnel and equipment resources needed to manage events hosted by the venue during its reconstruction. Stakeholder response to on-site parking restrictions include redevelopment of traffic management plans to accommodate parking demand, pedestrian access, and traffic flow in the immediate vicinity of the venue. Figure 34 presents a site and pedestrian accommodation plan for 2002 Green Bay Packers games during Lambeau Field renovation. Appendix F contains contingency parking and pedestrian accommodation plans for event patrons traveling to Lambeau Field.

**Figure 33**
**Stadium Reconstruction**

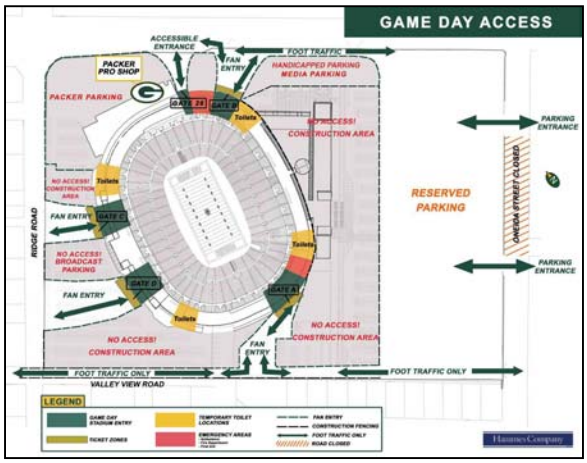


**Figure 34**
**Site and Pedestrian Accommodation Plan for Stadium Reconstruction**

Weather conditions affect travel demand, road/site capacity, or both. For example, in winter, snow banks in permanent venue parking areas reduce the number of on-site parking spaces required for an event sell-out. Rain can create significant problems

for unpaved parking areas and access roads. A one-day rain event totaling approximately 0.70 inches during the 2002 U.S. Golf Open forced the traffic management team to close all unpaved parking areas adjacent to the golf course. Figure 35 displays a traffic advisory service television announcement issued to indicate contingency parking arrangements that used paved lots.

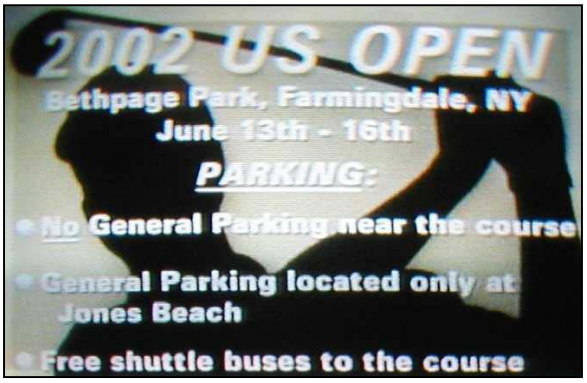


**Figure 35**
**Contingency Parking Plan for Weather**

## Concurrent Road Construction and Planned Special Events

The occurrence of planned events, including road construction and other planned special events, during a subject planned special event creates a range of impacts affecting different traffic management plan components. On a regional level, concurrent planned events reduce available capacity in roadway corridors serving a subject planned special event, thus affecting traffic flow patterns. Local impacts include reduced parking supply, in the event of other area planned special events, and restricted traffic circulation.

The identification of concurrent planned events requires interagency cooperation and outreach at the local, county, and state level. Figure 36 illustrates an example of a local department of public works (DPW) inventory, accessible through the DPW web site, of active local road construction and other planned special events affecting the jurisdiction. With regard to planning for a specific planned special event, the event planning team scan road construction activities in all jurisdictions within a certain travel time or distance radius, equivalent to the event market area, of the event venue. Appendix G contains a local stakeholder outreach letter prepared by the Wisconsin DOT to identify local road construction in the vicinity of Miller Park and scheduled during the 2002 All-Star baseball game.

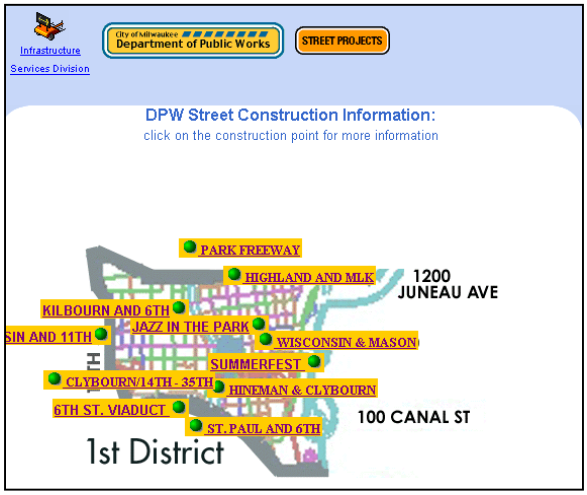


**Figure 36**
**Internet Summary of Road Construction and Planned Special Events *(Graphic courtesy of the City of Milwaukee DPW.)***

The event planning team must also interact with area venue operators and determine a timeline of planned special events in the region, particularly those affecting the transportation system serving the subject planned special event. Recognizing the regional impacts (e.g., county and multi-county) of major planned special events, the event planning team should obtain information, including attendance estimates, on planned special events occurring in other metropolitan areas and areas with large venues within a certain radius (e.g., 50 or 100 miles). Highway cor-

ridors traversing one jurisdiction can realize a significant increase in background traffic during typical off-peak periods as a result of traffic generated by major events occurring in other jurisdictions.

The event planning team should maintain, and continually update, a spreadsheet matrix or map of inter-jurisdictional roadway construction and planned special events occurring over some defined period of time. For example, Appendix G contains a Wisconsin DOT summary of local and state road construction coupled with major planned special events occurring in the Milwaukee metropolitan area over Summer 2002. Identification of concurrent planned events allows stakeholders to merge transportation planning and operations efforts and consider revising road construction schedules.

On a broader scale, a regional committee on planned special events monitors planned events across a metropolitan area through regular meetings with traffic operations agencies, law enforcement, community officials, event organizers, and other agencies. The committee facilitates communication and coordination between specific event planning and operation task forces to ensure optimal application of personnel and equipment resources. The Traffic Management Enhancement (TIME) program in southeastern Wisconsin maintains such a committee. As highlighted in Chapter 2, the TIME special event committee proposed development of a traffic management planning tool designed to evaluate the severity level of any planned special event proposed in the greater Milwaukee metropolitan area. Table 82 lists specific external factors, and associated criteria, accounted for in the draft planning tool.

| QUESTION | INCREASING EVENT IMPACT → CRITERIA | | | | |
|---|---|---|---|---|---|
| **What is the effect of construction on traffic?** | | | | | |
| Is there a construction project on any of the corridors leading to or away from the special event venue? | Not applicable | Some impact | Moderate impact | Considerable impact | Severe impact |
| Are there any lane closures? | | | | | |
| **What effect does the event scheduling have on traffic?** | | | | | |
| Is the event scheduled to begin or end during a peak period? | Not applicable | Some impact | Moderate impact | Considerable impact | Severe impact |
| Is there more than one event beginning or ending at the same time? | | | | | |
| **What are the weather conditions?** | | | | | |
| Is there a forecast for severe weather before, during, or after the special event that might affect traffic? | Clear | Mild | Moderate | Severe-summer | Severe-winter |
| **Are all human resources available?** | | | | | |
| Is the event scheduled to begin and end during normal working hours? | Yes | Most | Some | Few | None |
| Are key individuals available if needed? | | | | | |
| **Is all equipment available?** | | | | | |
| Are all facilities available? | Yes | Most | Some | Little | None |
| Is communication equipment working? | | | | | |
| Is all traffic control equipment available? | | | | | |

**Table 82**
**External Factors Considered in Wisconsin TIME Program Special Event Planning Tool[14]**

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